STM8T850C4
STM8T850G4

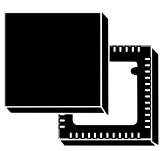
8-bit ultralow power touch sensing microcontroller with 16 Kbytes Flash, ProxSense™, timers, USART, SPI, I2C

Data brief

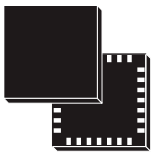
Features

- Operating conditions
  - Operating power supply: 1.65 V to 3.6 V
  - Temperature range: –40 °C to 85 °C
- Low power features
  - 4 low power modes: Wait, Active-halt with AWU (1 µA), Active-halt with ProxSense™ (10 µA with scan every 200 ms), Halt (0.4 µA)
  - Dynamic power consumption: 150 µA/MHz
  - Fast wakeup from Halt mode: 4.7 µs
  - Ultralow leakage per I/0: 50 nA
- Advanced STM8 Core
  - Harvard architecture with 3-stage pipeline
  - Max freq.16 MHz,16 CISC MIPS peak
- Memories
  - Up to 16 Kbytes of Flash program including up to 2 Kbytes of data EEPROM
  - Error correction code (ECC)
  - Flexible write and read protection modes
  - In-application and in-circuit programming
  - Data EEPROM capability
  - 4 Kbytes of static RAM
- Clock management
  - Internal 16 MHz factory-trimmed RC
  - Internal 38 kHz low consumption RC driving both the IWDG and the AWU
- Reset and supply management
  - Ultralow power, ultrasafe power-on reset/ power-down reset
- Interrupt management
  - Nested interrupt controller with software priority control
  - Up to 22 external interrupt sources
- I/Os
  - Up to 23 with 22 mappable on external interrupt vectors

ProxSense ™ is a trademark of Azoteq (Pty) Ltd.



UFQFPN48
7x7 mm



UFQFPN28
4x4 mm

- ProxSense™ patented acquisition technology with up to 300 touch sensing channels (20 receiver/transmit channels and 15 transmit channels) supporting projected capacitive acquisition method suitable for proximity detection.
- Timers
  - Two 16-bit general purpose timers (TIM2 and TIM3) with up and down counter and 2 channels (used as IC, OC, PWM)
  - One 8-bit timer (TIM4) with 7-bit prescaler
  - Independent watchdog
  - Window watchdog
  - Auto-wakeup unit
  - Beeper timer with 1, 2 or 4 kHz frequencies
- Communication interfaces
  - SPI synchronous serial interface
  - Fast I^2C Multimaster/slave 400 kHz
  - USART with fractional baud rate generator
- Development support
  - Hardware single wire interface module (SWIM) for fast on-chip programming and non intrusive debugging
  - In-circuit emulation (ICE)
- 96-bit unique ID

Table 1. Device summary

Order code	Package
STM8T850C4	UFQFPN48
STM8T850G4	UFQFPN28

For further information contact your local STMicroelectronics sales office. www.st.com

1 Description

The STM8T850C4/G4 devices are based on a generic set of state-of-the-art peripherals. The modular design of the peripheral set allows the same peripherals to be found in different ST microcontroller families including 32-bit families. This makes any transition to a different family very easy, and simplified even more by the use of a common set of development tools.

The STM8T850C4/G4 devices feature the enhanced STM8 CPU core providing increased processing power (up to 16 MIPS at 16 MHz) while maintaining the advantages of a CISC architecture with improved code density, a 24-bit linear addressing space and an optimized architecture for low power operations. It uses a ProxSense charge transfer capacitive acquisition method that is capable of near range proximity detection.

The family includes an integrated debug module with a hardware interface (SWIM) which allows non-intrusive in-application debugging and ultrafast Flash programming. All STM8T850C4/G4 microcontrollers feature low power low-voltage single-supply program Flash memory.

All devices of the STM8T850C4/G4 product line provide the following benefits:

- Advanced capacitive sensing
  - Patented ProxSense™ acquisition engine, providing high-end acquisition, filtering and environment adaptation
  - Outstanding signal-to-noise ratio for touch and proximity sensing
  - Up to 300 projected capacitive channels
- Reduced system cost
  - Up to 16 Kbytes of low-density embedded Flash program memory including up to 2 Kbytes of data EEPROM
  - High system integration level with internal clock oscillators and watchdogs
  - Smaller battery and cheaper power supplies
- Low power consumption and advanced features
  - Up to 16 MIPS at 16 MHz CPU clock frequency
  - Less than 150 µA/MHz, 0.8 µA in Active-halt mode with AWU, and 0.3 µA in Halt mode
  - Clock gated system and optimized power management
- Short development cycles
  - Application scalability across a common family product architecture with compatible pinout, memory map and modular peripherals
  - Full documentation and a wide choice of development tools
- Product longevity
  - Advanced core and peripherals made in a state-of-the-art technology
  - Product family operating from 1.65 V to 3.6 V supply

For complete information on the microcontroller memory, registers and peripherals, please refer to the STM8T850xx reference manual (RM0060) and to the STM8T850 Flash programming manual (PM0077) for Flash memory related information. For information on the debug module and SWIM (single wire interface module), refer to the STM8 SWIM communication protocol and debug module user manual (UM0470).

Note: ProxSense ™ is a trademark of Azoteq (Pty) Ltd.

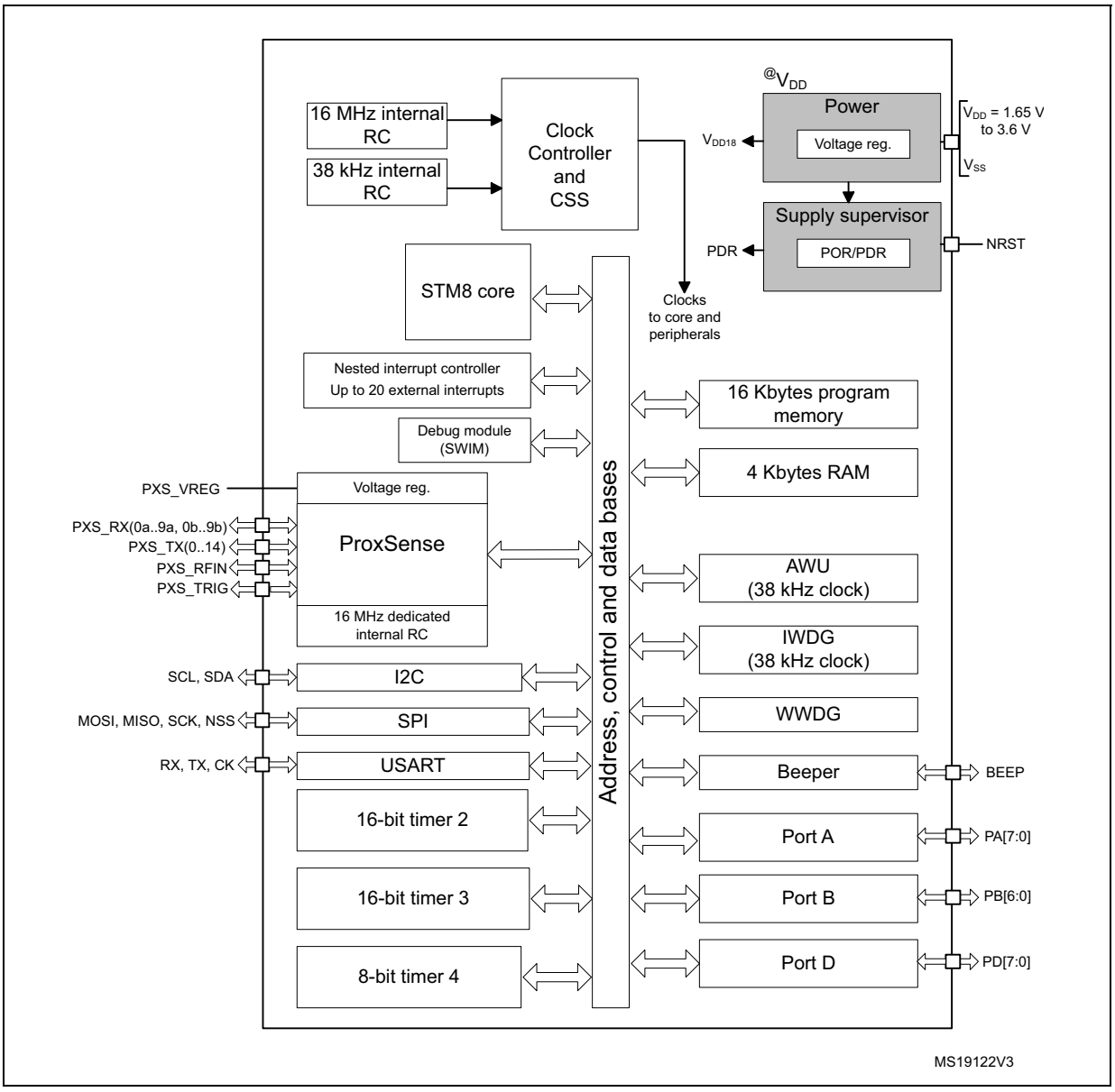
1.1 Device overview

Table 2. Device features

Features		STM8T850C4	STM8T850G4
Flash (Kbytes)		16	
Data EEPROM (Kbytes)		2	
RAM (Kbytes)		4	
Timers	Basic	1 (8-bit)	
	General purpose	2 (16-bit)	
Communication Interfaces	SPI	1	
	I2C	1	
	USART	1	
GPIOs		23	17
ProxSense		Up to 300 touch sensing channels (20 receiver/transmit channels and 15 transmit channels)	Up to 72 touch sensing channels (8 receiver/transmit channels and 9 transmit channels)
Others		Window watchdog, independent watchdog, two 16-MHz and one 38-kHz internal RC, auto-wakeup counter, beeper	
CPU frequency		16 MHz	
Operating voltage		1.65 to 3.6 V	
Operating temperature		-40 to +85 °C	
Packages		UFQFPN48	UFQFPN28

1.2 Product overview

Figure 1. STM8T850 device block diagram



Legend:

AWU: Auto-wakeup unit
Int. RC: internal RC oscillator
I²C: Inter-integrated circuit multimaster interface
POR/PDR: Power on reset / power down reset
SPI: Serial peripheral interface
SWIM: Single wire interface module
USART: Universal synchronous / asynchronous receiver / transmitter
IWDG: Independent watchdog
WWDG: Window watchdog
ProxSense™: capacitive sensing peripheral

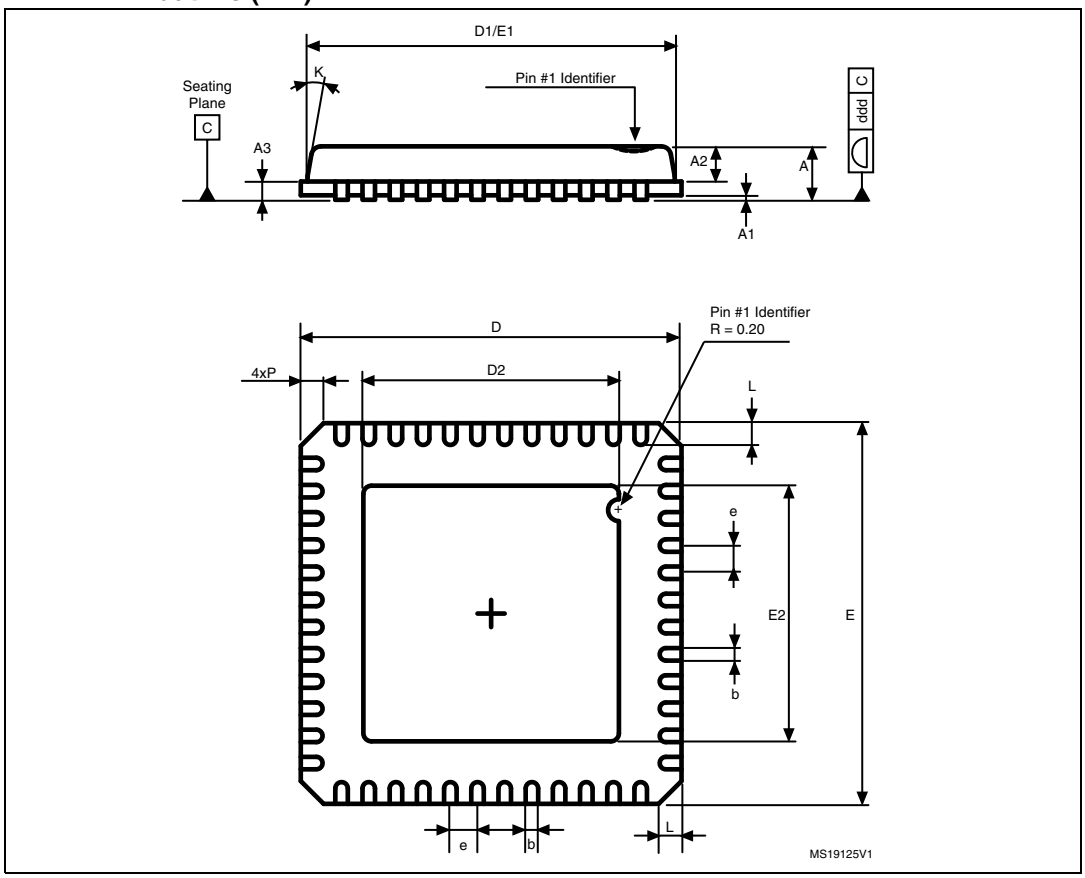
2 Package characteristics

2.1 ECOPACK®

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

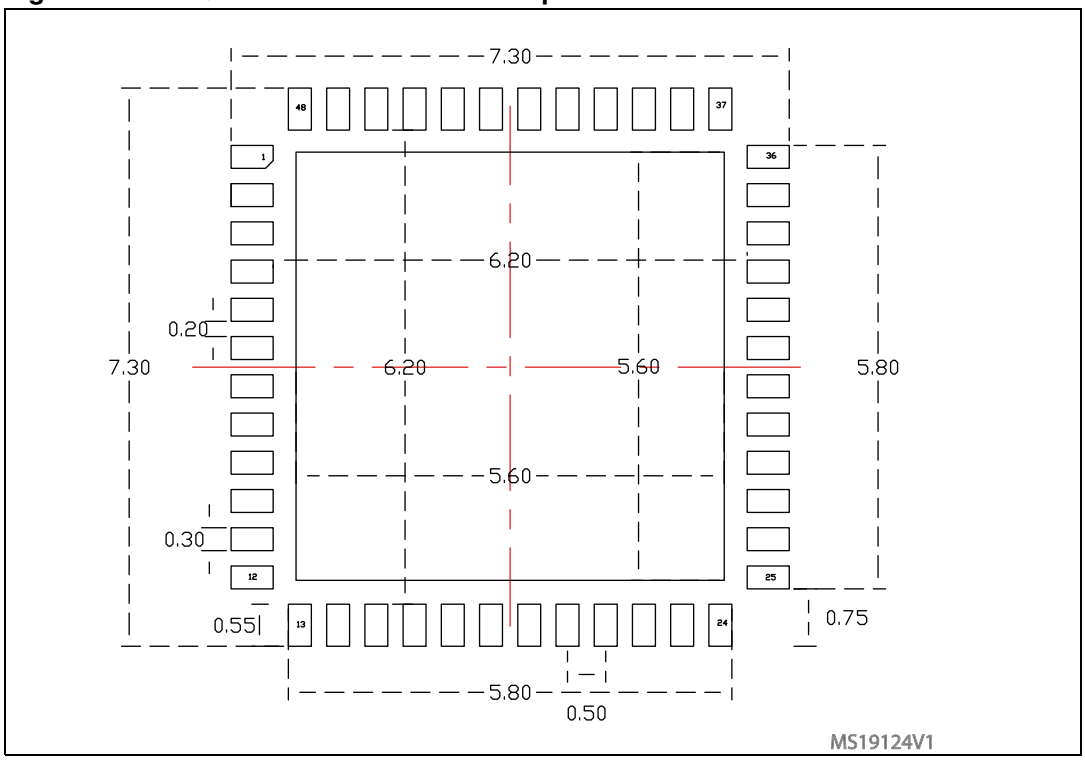
2.2 Package mechanical data

Figure 2. UFQFPN48 - 48-lead ultra thin fine pitch quad flat no-lead package outline (7x7)



1. Drawing is not to scale.

Figure 3. UFQFPN48 recommended footprint



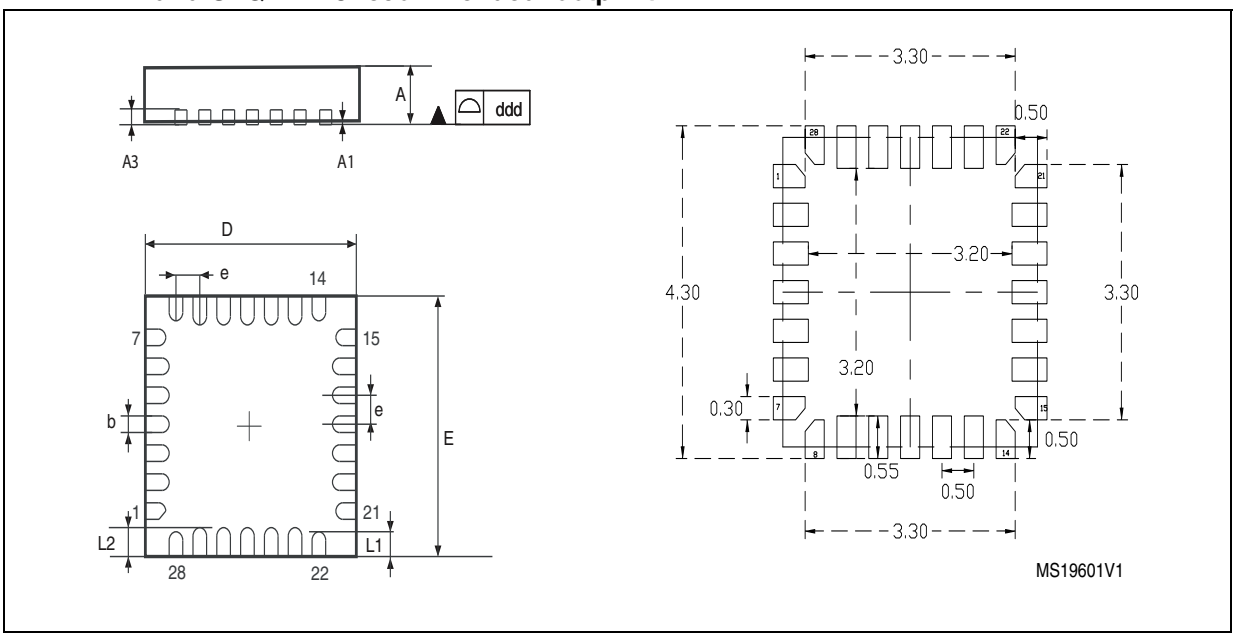
1. Drawing is not to scale
2. Dimensions are in millimeters

Table 3. UFQFPN48 - 48-lead ultra thin fine pitch quad flat no-lead package (7x7), package mechanical data

Dim.	mm			inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.800	0.900	1.000	0.0315	0.0354	0.0394
A1	-	0.020	0.050	-	0.0008	0.0020
A2	-	0.650	1.000	-	0.0256	0.0394
A3	-	0.200	-	-	0.0079	-
b	0.180	0.250	0.300	0.0071	0.0098	0.0118
D	6.850	7.000	7.150	0.2697	0.2756	0.2815
D1	-	6.750	-	-	0.2657	-
D2	-	-	-	-	-	-
E	6.850	7.000	7.150	0.2697	0.2756	0.2815
E1	-	6.750	-	-	0.2657	-
E2	-	-	-	-	-	-
e	-	0.500	-	-	0.0197	-
L	0.300	0.400	0.500	0.0118	0.0157	0.0197
P	-	-	0.600	-	-	0.0236
K	12 °					
ddd	-	-	-	-	-	0.0031
	Number of pins					
N	48					

1. Values in inches are converted from mm and rounded to 4 decimal digits.

Figure 4. UFQFPN28 - 28-lead ultra thin fine pitch quad flat no-lead package outline (4x4) and UFQFPN28 recommended footprint



1. Drawing is not to scale.
2. Dimensions are in millimeters.

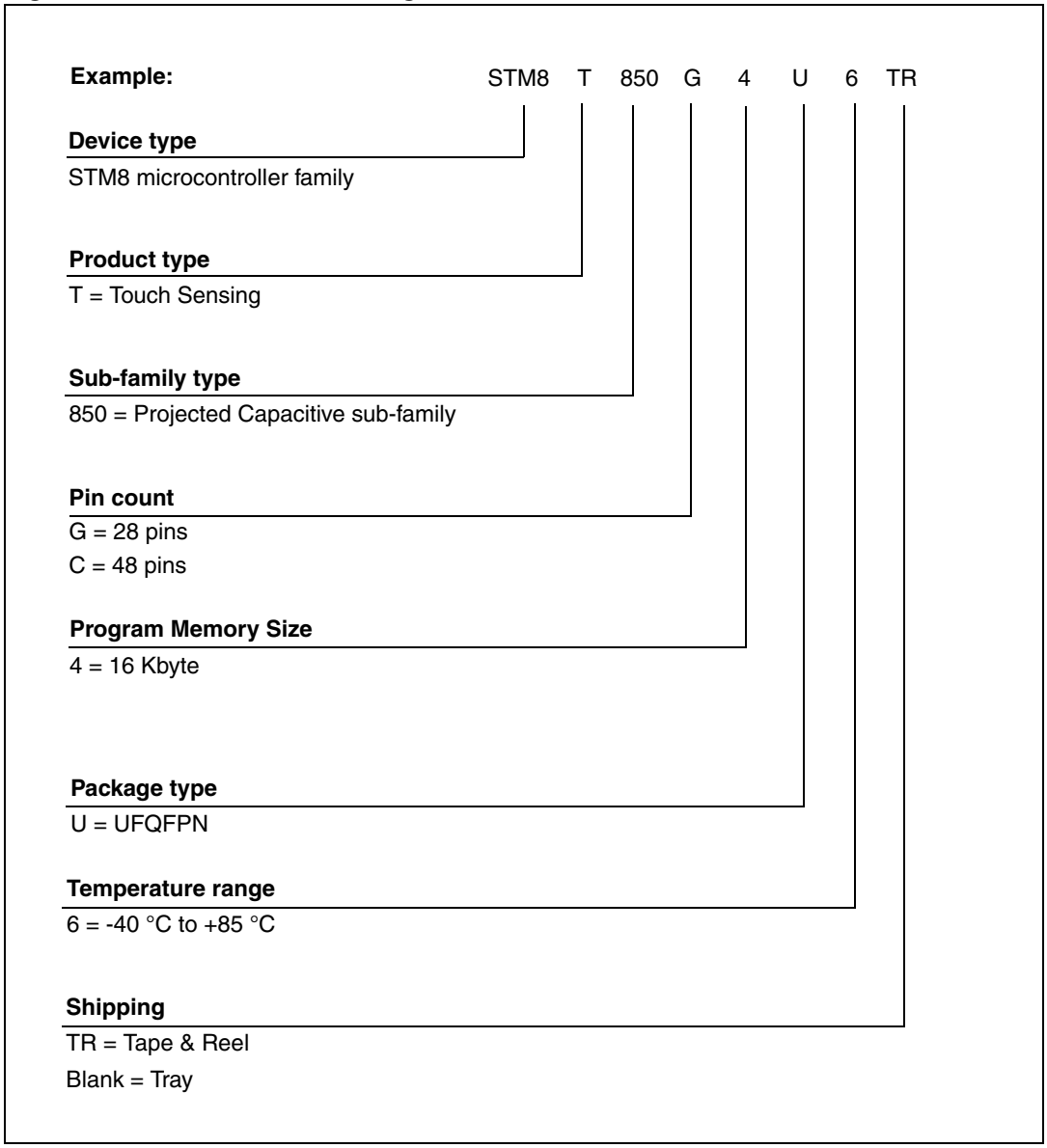
Table 4. UFQFPN28 - 28-lead ultra thin fine pitch quad flat no-lead package (4x4), package mechanical data

Dim.	mm			inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.5	0.55	0.6	0.0197	0.0217	0.0236
A1	0	0.02	0.05	0	0.0008	0.002
A3	-	0.152	-	-	0.0060	-
b	0.18	0.25	0.3	0.0071	0.0098	0.0118
D	-	4	-	-	0.1575	-
E	-	4	-	-	0.1575	-
e	-	0.5	-	-	0.0197	-
L1	0.25	0.35	0.45	0.0098	0.0138	0.0177
L2	0.3	0.4	0.5	0.0118	0.0157	0.0197
ddd	-	0.08	-	-	0.0031	-
	Number of pins					
N	28					

1. Values in inches are converted from mm and rounded to 4 decimal digits.

3 Device ordering information

Figure 5. STM8T850xx ordering information scheme



1. For a list of available options (e.g. memory size, package) and orderable part numbers or for further information on any aspect of this device, please go to *www.st.com* or contact the ST Sales Office nearest to you.

4 STM8 development tools

Development tools for the STM8 microcontrollers include the full-featured STice advanced in-circuit emulation system supported by a complete software tool package including C compiler, assembler and integrated development environment with high-level language debugger. In addition, the STM8 is to be supported by a complete range of tools including starter kits, evaluation boards and a low-cost in-circuit debugger/programmer.

4.1 Software tools

STM8 development tools are supported by a complete, free software package from STMicroelectronics that includes ST Visual Develop (STVD) IDE and the ST Visual Programmer (STVP) software interface. STVD provides seamless integration of the Cosmic and Raisonance C compilers for STM8. A free version that outputs up to 32 Kbytes of code is available.

4.1.1 STM8 toolset

STM8 toolset with STVD integrated development environment and STVP programming software is available for free download at www.st.com. This package includes:

ST Visual Develop (STVD) – Full-featured integrated development environment from ST, featuring

- Seamless integration of C and ASM toolsets
- Full-featured debugger
- Project management
- Syntax highlighting editor
- Integrated programming interface
- Support of advanced emulation features for STice such as code profiling and coverage

ST Visual Programmer (STVP) – Easy-to-use, unlimited graphical interface allowing read, write and verify of your STM8 microcontroller's Flash program memory, data EEPROM and option bytes. STVP also offers project mode for saving programming configurations and automating programming sequences.

4.1.2 STM-STUDIO

STM-STUDIO helps debug and diagnose STM8 and STM32 applications while they are running by reading and displaying their variables in real-time. STM-STUDIO perfectly complements traditional debugging tools to fine tune applications. It is well suited for debugging applications which cannot be stopped, such as Touchsensing applications. Its easy-to-use, graphical interface features:

- Non-intrusive read on-the-fly variables from RAM while the application is running
- Parse DWARF debugging information in the ELF application executable file
- Possibility to log data into a file, and replay later (exhaustive record display, not real-time)
- 2 types of viewers:
  - Variable viewer: Real-time waveforms, oscilloscope-like graphs
  - TouchPoint viewer: Association of 2 variables, one on the X axis, one on the Y axis

4.1.3 C and assembly toolchains

Control of C and assembly toolchains is seamlessly integrated into the STVD integrated development environment, making it possible to configure and control the building of your application directly from an easy-to-use graphical interface.

Available toolchains include:

- ***Cosmic C compiler for STM8*** – One free version that outputs up to 32 Kbytes of code is available. For more information, see www.cosmic-software.com.
- ***IAR embedded workbench*** – The C compiler for STM8 which is included in the toolset is free for up to 8Kbytes of code. For more information, see www.iar.com.
- ***Raisonance C compiler for STM8*** – One free version that outputs up to 32 Kbytes of code. For more information, see www.raisonance.com.
- ***STM8 assembler linker*** – Free assembly toolchain included in the STVD toolset, which allows you to assemble and link your application source code.

4.2 Programming tools

During the development cycle, STice provides in-circuit programming of the STM8 Flash microcontroller on your application board via the SWIM protocol. Additional tools are to include a low-cost in-circuit programmer as well as ST socket boards, which provide dedicated programming platforms with sockets for programming your STM8.

For production environments, programmers will include a complete range of gang and automated programming solutions from third-party tool developers already supplying programmers for the STM8 family.

5 Revision history

Table 5. Document revision history

Date	Revision	Changes
10-May-20011	1	Initial release.

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